

What is Claimed is:

1. A computerized method of constructing a sampling plan for items that are manufactured, comprising the steps of:

inputting into a computer, a desired Acceptable Quality Limit (AQL), a desired Key Defect Rate (KDR), a desired power of the sampling plan for the items that are manufactured and a desired false alarm rate for the sampling plan; and

calculating in the computer, a required sample size to provide the desired AQL, the desired KDR, the desired power of the sampling plan for the items that are manufactured and the desired false alarm rate for the sampling plan.

2. A method according to Claim 1 wherein the calculating step further comprises the step of calculating in the computer a decision rule critical value based upon the required sample size to provide the desired AQL, the desired KDR, the desired power of the sampling plan for the items that are manufactured and the desired false alarm rate for the sampling plan.

3. A method according to Claim 2 wherein the calculating step is followed by the step of graphically displaying a relationship between sample size, acceptable number of defective items and false alarm rate, based upon the desired AQL, the desired KDR and the desired power of the sampling plan for the items that are manufactured.

4. A method according to Claim 2 wherein the calculating step is followed by the steps of:

sampling the items that are manufactured at the required sample size to obtain samples; and

determining the number of defective items in the samples.

5. A method according to Claim 2 wherein the calculating step is followed by the steps of:

sampling the items that are manufactured at the required sample size to obtain samples; and

measuring a response variable for the each of the samples.

6. A method according to Claim 5 wherein the measuring step is followed by the steps of:

inputting into the computer the measured response variable for each of the samples; and

5 calculating in the computer, an estimate of the quality level (QL) for the items that are manufactured, based on the measured response variable for each of the samples.

7. A method according to Claim 1 wherein the calculating step is preceded by the steps of:

calculating a sampling distribution that is variance invariant based on a normal distribution;

5 formulating a percentile grid of sample size and a true process defect rate, based on estimated percentiles of a cumulative distribution of the sampling distribution;

formulating a bias corrected percentile grid of sample size and the true process defect rate from the percentile grid; and

10 storing the bias corrected percentile grid in the computer.

8. A method according to Claim 1 wherein the calculating step comprises the steps of:

5 computing a decision rule critical value from the AQL and the false alarm rate, across a plurality of sample sizes, using a bias corrected percentile grid of sample size and a true process defect rate; and

evaluating the bias corrected percentile grid for the decision rule critical value, to determine a sample size.

9. A method according to Claim 6 wherein the step of calculating an estimate of QL comprises the steps of:

computing a bias correction coefficient;

5 computing a QL test statistic as a function of the bias correction coefficient and at least one quantile from a cumulative distribution function of a central t distribution with at least one argument that is a function of a sample mean, a sample standard deviation, the sample size and specification limits; and

determining whether the QL test statistic is at least equal to the decision rule critical value.

10. A method according to Claim 5 wherein the measuring step is followed by the steps of:

inputting into the computer the measured response variable for each of the samples; and

5 calculating in the computer, a point estimate of the number of out-of-specification items that are manufactured, based on the measured response variable for each of the samples.

11. A computerized method of constructing a sampling plan for items that are manufactured, comprising the steps of:

inputting into a computer, a desired sample size, a desired false alarm rate, a desired Acceptable Quality Limit (AQL) and a desired power of the sampling plan for
5 the items that are manufactured; and

calculating in the computer, a Key Defect Rate (KDR) that is produced from the desired sample size, the desired false alarm rate, the desired AQL and the desired power of the sampling plan for the items that are manufactured.

12. A method according to Claim 11 wherein the calculating step comprises the step of:

computing a decision rule critical value based on the desired AQL and the desired false alarm rate for the desired sample size.

13. A method according to Claim 11 wherein the calculating step is followed by the step of graphically displaying a relationship between acceptable number of defective items and false alarm rate, based upon the desired AQL, the desired KDR and the desired power of the sampling plan for the items that are
5 manufactured.

14. A method according to Claim 11 wherein the calculating step is followed by the steps of:

sampling the items that are manufactured at the desired sample size to obtain samples; and

5 determining the KDR of the items that are manufactured from the samples.

15. A method according to Claim 11 wherein the calculating step is followed by the steps of:

sampling the items that are manufactured at the desired sample size to obtain samples; and

5 measuring a response variable for the each of the samples.

16. A method according to Claim 15 wherein the measuring step is followed by the steps of:

inputting into the computer the measured response variable for each of the samples; and

5 calculating in the computer, an estimate of the KDR for the items that are manufactured, based on the measured response variable for each of the samples.

17. A method according to Claim 11 wherein the calculating step is preceded by the steps of:

calculating a sampling distribution that is variance invariant based on a normal distribution;

5 formulating a percentile grid of sample size and a true process defect rate, based on estimated percentiles of a cumulative distribution of the sampling distribution;

formulating a bias corrected percentile grid of sample size and the true process defect rate from the percentile grid; and

10 storing the bias corrected percentile grid in the computer.

18. A method according to Claim 12 wherein the calculating step comprises the steps of:

computing a decision rule critical value from the AQL, the false alarm rate and the desired sample size, using a bias corrected percentile grid of sample size and a

5 true process defect rate; and

evaluating the bias corrected percentile grid for values that are larger than the AQL, with the percentile being the desired power.

19. A method according to Claim 15 wherein the measuring step is followed by the steps of:

inputting into the computer the measured response variable for each of the samples; and

calculating in the computer, a point estimate of a process defect rate for the items that are manufactured, based on the measured response variable for each of the samples.

20. A computer system for constructing a sampling plan for items that are manufactured, the system comprising:

means for inputting a desired Acceptable Quality Limit (AQL), a desired Key Defect Rate (KDR), a desired power of the sampling plan for the items that are
5 manufactured and a desired false alarm rate for the sampling plan; and

means for calculating a required sample size to provide the desired AQL, the desired KDR, the desired power of the sampling plan for the items that are manufactured and the desired false alarm rate for the sampling plan.

21. A system according to Claim 20 wherein the calculating means further comprises means for calculating a decision rule critical value based upon the required sample size to provide the desired AQL, the desired KDR, the desired power of the sampling plan for the items that are manufactured and the desired false alarm rate for
5 the sampling plan.

22. A system according to Claim 21 further comprising:

means for graphically displaying a relationship between sample size, acceptable number of defective items and false alarm rate, based upon the desired AQL, the desired KDR and the desired power of the sampling plan for the items that
5 are manufactured.

23. A system according to Claim 21 further comprising:

means for inputting a measured response variable for each of a plurality of samples of the items that are manufactured; and

means for calculating an estimate of the quality level (QL) for the items that are manufactured, based on the measured response variable for each of the samples.

24. A system according to Claim 20 further comprising:

means for calculating a sampling distribution that is variance invariant based on a normal distribution;

means for formulating a percentile grid of sample size and a true process defect rate, based on estimated percentiles of a cumulative distribution of the sampling distribution;

means for formulating a bias corrected percentile grid of sample size and the true process defect rate from the percentile grid; and

means for storing the bias corrected percentile grid.

25. A system according to Claim 20 wherein the means for calculating comprises:

means for computing a decision rule critical value from the AQL and the false alarm rate, across a plurality of sample sizes, using a bias corrected percentile grid of sample size and a true process defect rate; and

means for evaluating the bias corrected percentile grid for the decision rule critical value, to determine a sample size.

26. A system according to Claim 23 wherein the means for calculating an estimate of QL comprises:

means for computing a bias correction coefficient;

means for computing a QL test statistic as a function of the bias correction coefficient and at least one quantile from a cumulative distribution function of a central t distribution with at least one argument that is a function of a sample mean, a sample standard deviation, the sample size and specification limits; and

means for determining whether the QL test statistic is at least equal to the decision rule critical value.

27. A system according to Claim 23 further comprising:

means for inputting the measured response variable for each of a plurality of samples of the items that are manufactured; and

5 means for calculating a point estimate of the number of out-of-specification items that are manufactured, based on the measured response variable for each of the samples.

28. A computer system for constructing a sampling plan for items that are manufactured, the system comprising:

means for inputting a desired sample size, a desired false alarm rate, a desired Acceptable Quality Limit (AQL) and a desired power of the sampling plan for the
5 items that are manufactured; and

means for calculating a Key Defect Rate (KDR) that is produced from the desired sample size, the desired false alarm rate, the desired AQL and the desired
2 power of the sampling plan for the items that are manufactured.

29. A system according to Claim 28 wherein the means for calculating comprises:

means for computing a decision rule critical value based on the desired AQL and the desired false alarm rate for the desired sample size.

30. A system according to Claim 28 further comprising:

means for graphically displaying a relationship between acceptable number of defective items and false alarm rate, based upon the desired AQL, the desired KDR and the desired power of the sampling plan for the items that are manufactured.
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31. A system according to Claim 28 further comprising:

means for inputting a measured response variable for each of a plurality of samples of the items that are manufactured; and
means for calculating an estimate of the KDR for the items that are
5 manufactured, based on the measured response variable for each of the samples.

32. A system according to Claim 28 further comprising:

means for calculating a sampling distribution that is variance invariant based on a normal distribution;

means for formulating a percentile grid of sample size and a true process
5 defect rate, based on estimated percentiles of a cumulative distribution of the
sampling distribution;

means for formulating a bias corrected percentile grid of sample size and the
true process defect rate from the percentile grid; and

means for storing the bias corrected percentile grid.

33. A system according to Claim 29 wherein the means for calculating
comprises:

means for computing a decision rule critical value from the AQL, the false
alarm rate and the desired sample size, using a bias corrected percentile grid of
5 sample size and a true process defect rate; and

means for evaluating the bias corrected percentile grid for values that are
larger than the AQL, with the percentile being the desired power.

34. A system according to Claim 28 further comprising:

means for inputting a measured response variable for each of a plurality of
samples of the items that are manufactured; and

means for calculating a point estimate of a process defect rate for the items
that are manufactured, based on the measured response variable for each of the
samples.

35. A computer program product for constructing a sampling plan for
items that are manufactured, the computer program product comprising a computer-
readable storage medium having computer-readable program code means embodied in
the medium, the computer-readable program code means comprising:

5 computer-readable program code means for accepting a desired Acceptable
Quality Limit (AQL), a desired Key Defect Rate (KDR), a desired power of the
sampling plan for the items that are manufactured and a desired false alarm rate for
the sampling plan; and

computer-readable program code means for calculating a required sample size
10 to provide the desired AQL, the desired KDR, the desired power of the sampling plan
for the items that are manufactured and the desired false alarm rate for the sampling
plan.

36. A computer program product according to Claim 35 wherein the computer-readable program code calculating means further comprises means for calculating a decision rule critical value based upon the required sample size to provide the desired AQL, the desired KDR, the desired power of the sampling plan
5 for the items that are manufactured and the desired false alarm rate for the sampling plan.

37. A computer program product according to Claim 35 further comprising:

computer-readable program code means for graphically displaying a relationship between sample size, acceptable number of defective items and false
5 alarm rate, based upon the desired AQL, the desired KDR and the desired power of the sampling plan for the items that are manufactured.

38. A computer program product according to Claim 35 further comprising:

computer-readable program code means for accepting a measured response variable for each of a plurality of samples of the items that are manufactured; and
5 computer-readable program code means for calculating an estimate of the quality level (QL) for the items that are manufactured, based on the measured response variable for each of the samples.

39. A computer program product according to Claim 35 further comprising:

computer-readable program code means for calculating a sampling distribution that is variance invariant based on a normal distribution;
5 computer-readable program code means for formulating a percentile grid of sample size and a true process defect rate, based on estimated percentiles of a cumulative distribution of the sampling distribution;
computer-readable program code means for formulating a bias corrected percentile grid of sample size and the true process defect rate from the percentile grid;
10 and

computer-readable program code means for storing the bias corrected percentile grid.

40. A computer program product according to Claim 35 wherein the computer-readable program code means for calculating comprises:

computer-readable program code means for computing a decision rule critical value from the AQL and the false alarm rate, across a plurality of sample sizes, using
5 a bias corrected percentile grid of sample size and a true process defect rate; and

computer-readable program code means for evaluating the bias corrected percentile grid for the decision rule critical value, to determine a sample size.

41. A computer program product according to Claim 38 wherein the computer-readable program code means for calculating an estimate of QL comprises:

computer-readable program code means for computing a bias correction coefficient;

5 computer-readable program code means for computing a QL test statistic as a function of the bias correction coefficient and at least one quantile from a cumulative distribution function of a central t distribution with at least one argument that is a function of a sample mean, a sample standard deviation, the sample size and specification limits; and

10 computer-readable program code means for determining whether the QL test statistic is at least equal to the decision rule critical value.

42. A computer program product according to Claim 38 further comprising:

computer-readable program code means for accepting the measured response variable for each of a plurality of samples of the items that are manufactured; and

5 computer-readable program code means for calculating a point estimate of the number of out-of-specification items that are manufactured, based on the measured response variable for each of the samples.

43. A computer program product for constructing a sampling plan for items that are manufactured, the computer program product comprising a computer-

readable storage medium having computer-readable program code means embodied in the medium, the computer-readable program code means comprising:

5 computer-readable program code means for accepting a desired sample size, a desired false alarm rate, a desired Acceptable Quality Limit (AQL) and a desired power of the sampling plan for the items that are manufactured; and

computer-readable program code means for calculating a Key Defect Rate (KDR) that is produced from the desired sample size, the desired false alarm rate, the
10 desired AQL and the desired power of the sampling plan for the items that are manufactured.

44. A computer program product according to Claim 43 wherein the computer-readable program code means for calculating comprises:

computer-readable program code means for computing a decision rule critical value based on the desired AQL and the desired false alarm rate for the desired
5 sample size.

45. A computer program product according to Claim 43 further comprising:

computer-readable program code means for graphically displaying a relationship between acceptable number of defective items and false alarm rate, based
5 upon the desired AQL, the desired KDR and the desired power of the sampling plan for the items that are manufactured.

46. A computer program product according to Claim 43 further comprising:

computer-readable program code means for accepting a measured response variable for each of a plurality of samples of the items that are manufactured; and

5 computer-readable program code means for calculating an estimate of the KDR for the items that are manufactured, based on the measured response variable for each of the samples.

47. A computer program product according to Claim 43 further comprising:

computer-readable program code means for calculating a sampling distribution that is variance invariant based on a normal distribution;

5 computer-readable program code means for formulating a percentile grid of sample size and a true process defect rate, based on estimated percentiles of a cumulative distribution of the sampling distribution;

computer-readable program code means for formulating a bias corrected percentile grid of sample size and the true process defect rate from the percentile grid;

10 and

computer-readable program code means for storing the bias corrected percentile grid.

48. A computer program product according to Claim 44 wherein the computer-readable program code means for calculating comprises:

computer-readable program code means for computing a decision rule critical value from the AQL, the false alarm rate and the desired sample size, using a bias
5 corrected percentile grid of sample size and a true process defect rate; and

computer-readable program code means for evaluating the bias corrected percentile grid for values that are larger than the AQL, with the percentile being the desired power.

49. A computer program product according to Claim 43 further comprising:

computer-readable program code means for inputting a measured response variable for each of a plurality of samples of the items that are manufactured; and

5 computer-readable program code means for calculating a point estimate of a process defect rate for the items that are manufactured, based on the measured response variable for each of the samples.